

1 PLAN AND PREPARE**Explore the Concept**

- Students will collect data and model their data with an exponential function.
- This activity leads into the study of finding exponential models in Example 2 in Lesson 7.7.

Materials

Each student or group of students will need:

- 100 pennies
- a cup
- graphing calculator

Recommended Time

Work activity: 10 min

Discuss results: 10 min

Grouping

Students can work individually or in pairs. If students work in pairs, they can alternate between shaking the pennies and removing and counting the “heads.”

2 TEACH**Key Discovery**

Approximately half the pennies will be removed each time, so that the function $y = 100 \cdot \left(\frac{1}{2}\right)^x$, or, equivalently, $y = 100 \cdot 2^{-x}$ will theoretically model the data. The actual result with real data may vary somewhat from this.

3 ASSESS AND RETEACH

If you repeated this experiment 10 times and combined your results, what would you expect to find? **The result would probably be closer to the theoretical model.**

7.7 Model Data with an Exponential Function

MATERIALS • 100 pennies • cup • graphing calculator

QUESTION How can you model data with an exponential function?

EXPLORE Collect and record data

STEP 1 Make a table

Make a table like the one shown to record your results. **Check students' work.**

Number of toss, x	0	1	2	3	4	5	6	7
Number of pennies remaining, y	?	?	?	?	?	?	?	?

STEP 2 Perform an experiment

Record the initial number of pennies in the table, and place the pennies in a cup. Shake the pennies, and then spill them onto a flat surface.



Remove all of the pennies showing “heads.” Count the number of pennies remaining, and record this number in the table.

STEP 3 Continue collecting data

Repeat Step 2 with the remaining pennies until there are no pennies left to return to the cup.

DRAW CONCLUSIONS Use your observations to complete these exercises

- What is the initial number of pennies? By what percent would you expect the number of pennies remaining to decrease after each toss? **100; 50%**
- Use your answers from Exercise 1 to write an exponential function that should model the data in the table. **$y = 100(0.5)^x$**
- Use a graphing calculator to make a scatter plot of the data pairs (x, y) . In the same viewing window, graph your function from Exercise 2. Is the function a good model for the data? **Explain. Yes; the curve is very close to the data points.**
- Use the calculator's *exponential regression* feature to find an exponential function that models the data. *Compare* this function with the function you wrote in Exercise 2. **Check students' work.**